

work here on earth by fashioning microorganisms that are capable of living in highly acidic or strongly basic environments. Scientists have discovered a species of bacteria—*Ferroplasma acidiphilum*—growing in the drainage water of abandoned California mines. In spots, the pH of this water is 0.

At the other end of the spectrum, our Lord demonstrates his sweet tenderness through his design of several organisms that are extremely sensitive to pH. The hydrangea plant is an example. In slightly acidic soil, hydrangea flowers turn blue, but they are pink in basic soil. (The color reaction of hydrangeas is the exact opposite of litmus paper, which changes pink in acid and blue in a base.)

Incidentally, if we mix a strong acid with a weak base, the base is neutralized by the acid and salt is the result. In light of this, it might be instructive to contemplate why Jesus calls Christians “the salt of the earth” (Matthew 5:13). Our Lord Jesus desires that we become a “new creation” (2 Corinthians 5:17). There’s

only one way for this to happen: we must be united to God through Christ, allowing his holiness to act like an “acid bath” upon the baseness of our hearts. Then, and only then, will we become the salt of the earth—the “truth brokers” that our bland world desperately needs!

Customer service/subscription number: 1-800-998-0737. Published by Jim Kraus, designed by Mary Pappas, edited by R.J. Destree. Copyright © 2012 HIS NATURE, issue 20. *His Nature* is published monthly by Tyndale House Publishers, Inc., 351 Executive Dr., Carol Stream, IL 60188, in partnership with the ministry of *His Creation*, www.hiscreation.com. Printed in the USA. Subscription \$12 per month per 100 copies. Canada: \$14 per 100 per month. Cover photo © Brasil2/iStockphoto. Interior photo © Nick Biemans/iStockphoto. All rights reserved. POSTMASTER: Send address changes to *His Nature*, Subscription Services, P.O. Box 464, Mt. Morris, IL 61054.

*Therefore, if anyone is in Christ,  
he is a new creation.*

2 CORINTHIANS 5:17

HIS  
*Nature*

*“You are the salt of the earth.”*  
MATTHEW 5:13

## THE ACID TEST

If you are stung by a wasp, should you apply baking soda or vinegar to your skin? Baking soda (sodium bicarbonate) and vinegar are common kitchen chemicals that fall into the category of acids and bases. As such, they have something in common with countless other substances on earth, including the venom of animals. We now know that Christ has filled our world with millions of different acids and bases, several of which are essential to our survival. More important, these chemicals mirror Christ’s power, beauty, provision, and compassion.

Many things in your home are either acids or bases: lemon juice, for instance, is about 5% to 6% citric acid. Sodium hydroxide—



*Cashew fruit*

a very powerful base—is the main constituent of drain cleaner. And the foods we eat frequently contain acids and bases because these enhance the foods’ taste.

### pH scale:

- strong acid**
- 0 — sulfuric acid
  - 1 — stomach acid
  - 2 — soft drinks, lemons
  - 3 — vinegar
  - 4 — tomatoes
- weak acid**
- 5 — coffee, bee sting
  - 6 — milk

*continued...*



### pH scale:

- neutral 7 — tap water, wasp sting  
8 — sea water
- weak base 9 — baking soda,  
hand soap  
10 — milk of magnesia  
11 — ammonia  
12 — bleach  
13 — drain cleaner
- strong base 14 — sodium hydroxide

It's fascinating to note that God instilled at least 48 different organic acids into brewed coffee. No wonder imbibing this popular beverage often produces a sour stomach! Yet, the caffeine in coffee is a base, and it is caffeine that gives coffee its slightly bitter taste.

You'll never see cashew nuts being sold in grocery stores while still in their shells—as you do with walnuts, pecans, and peanuts. That's because the shell of a cashew is covered with anacardic acid, which causes severe irritation if it comes in contact with the skin or lungs. (Anacardic acid is chemically similar to the substance found in poison ivy.) Cashews are roasted to remove this acid. But why would our Lord Jesus put such a caustic

liquid on something as delicious as cashews? Science has learned that anacardic acid is lethal to bacteria, so it creates an effective germ barrier, protecting the cashews from bacterial infection.

There are many acids and bases essential to life's survival. All organisms contain cellular DNA—deoxyribonucleic acid. The building blocks of protein molecules, such as those found in your muscles, are amino acids. And fatty acids are integral to a healthy diet.

People often ask, "What is the strongest acid in the world?" That's a difficult question to answer. Some scientists say it is perchloric acid ( $\text{HClO}_4$ ), although hydrofluoric acid ( $\text{HF}$ ) is considered by many to be the nastiest of them all. The deadliest commonly occurring acids are hydrochloric ( $\text{HCl}$ ), sulfuric ( $\text{H}_2\text{SO}_4$ ), and nitric ( $\text{HNO}_3$ ).

Nitric acid is produced in the atmosphere during a thunderstorm. As lightning rapidly burrows its way through the air, intense heat converts nitrogen and oxygen gas ( $\text{N}_2$  and  $\text{O}_2$ ) into nitrogen

dioxide. When dissolved in water, nitrogen dioxide turns into nitric acid. The rain water also dilutes this powerful chemical so that by the time it reaches the ground, it's much weaker in pH.

Volcanoes belch out a number of poisonous substances, including hydrochloric and sulfuric acids. These deadly chemicals can severely lower the pH of nearby lakes, making them as acidic as your stomach (pH 1).

The parietal cells of your stomach regularly secrete hydrochloric acid as an aid in food digestion. A vulture's stomach also contains this highly corrosive chemical. It allows the bird to safely eat decaying, germ-laden carcasses. Although we might not think so, God displays his kindness to the vulture by giving this bird an extra special use for its gastric acid. If you happen to startle a vulture, it will vomit foul-smelling, highly acidic, and partially digested meat in your general direction as a defense mechanism. So it's best not to surprise a vulture!

It's actually fairly common to find acids and bases used in defense throughout nature. Formic acid



*King vulture*

( $\text{CH}_2\text{O}_2$ ) is the primary assailant in the stings of ants. Injection into the skin leads to an intense burning sensation for anyone unfortunate enough to be attacked by an ant colony. The plant called stinging nettle (*Urtica dioica*) possesses sharp needles containing a cocktail of formic acid, histamine, serotonin, and choline. Formic acid, along with these other chemicals, is freely injected into the skin of the unwary passerby, causing a burning sensation similar to that of ants. A bee sting is also acidic—it contains apotoxin, which has a pH of 5. The pH of wasp venom, on the other hand, is close to 7 and therefore neutral. Thus treatment with either vinegar or baking soda is ineffective with wasp stings.

Christ Jesus further demonstrates the greatness of his creative

*continued...*